

Analysis of Institutional Blood Glucose Surveillance

Mona Boaz, Ph.D.,¹ Zohar Landau, M.D.,² and Julio Wainstein, M.D.²

Abstract

In an article by Anderson and colleagues in this issue of *Journal of Diabetes Science and Technology*, the 2009 Remote Automated Laboratory System Report describes the use of a proprietary software application in 576 United States hospital benchmark subscribers, permitting blood glucose surveillance. The Program for the Treatment of the Hospitalized Diabetic Patient was initiated at Edith Wolfson Medical Center in 2007 and included an automated glucometer in each inpatient department. Results are transmitted automatically to a central database. Importantly, these data interface with the patient electronic medical record, permitting accurate patient follow-up within and between hospitalizations; the patient response-to-treatment evaluation; identification of secular glucose trends; and interdepartmental and interinstitutional comparisons. The data have been associated with a significant reduction in random blood glucose values. In Israel, the National Diabetes Council has recommended the use of automated institutional glucometers in all hospitals.

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In their study, Benchmarking Glucose Results Through Automation: The 2009 Remote Automated Laboratory System (RALS) Report, Anderson and colleagues¹ describe the use of a proprietary software application added to the existing RALS-Plus data management system in 576 of the United States (U.S.) hospitals subscribed to benchmarking reports. Automatically extracting de-identified blood glucose values captured by standard bedside point-of-care glucometers, this application downloads data to the test information management system and transfers them via secured internet connection to the administrator (medical automation systems), where reports are created and delivered electronically to the hospital subscribers. A most impressive number of blood glucose values—

more than 175 million—were collected from 2006–2009 and serve as the basis of the report.

Benchmarking permits hospitals to compare mean blood glucose values and trends with a large hospital population; however, the quality of such comparisons is limited by the benchmarked data. As correctly pointed out by the authors,¹ hospitals participating in the present report are self-selected, represent 38% of all hospitals subscribing to the RALS-Plus user population, and do not appear to be representative of all U.S. hospitals. Nevertheless, the system provides a glimpse of geographic and temporal trends, and findings can be associated with health care policy events, generating testable hypotheses.

Author Affiliations: ¹Epidemiology and Research Unit, E. Wolfson Medical Center, Holon, Israel, and ²Diabetes Unit, E. Wolfson Medical Center, Holon, Israel

Abbreviations: (HbA1c) hemoglobin A1c, (IGMS) institutional blood glucose monitoring system, (PTHDP) Program for the Treatment of the Hospitalized Diabetic Patient, (RALS) Remote Automated Laboratory System

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Corresponding Author: Mona Boaz, Ph.D., Epidemiology and Research Unit, E. Wolfson Medical Center, Halohamim 62, Holon, Israel; email address mboaz8@yahoo.com

Clearly this can serve as a meaningful tool for hospital administrators, health policy makers, and investigators.

On a more local level, however, this system may be of limited value in improving in-hospital hyperglycemia. In-hospital glucose control is clinically meaningful for patients with and without diabetes,²⁻⁴ and hospitalization is viewed by many clinicians as a window of opportunity to improve diabetes care.⁵ But in-hospital glucose homeostasis requires patient identification to track an individual's values over time. Further, the ability to integrate this information with the electronic medical record permits synthesis of a complete clinical picture.

In August 2007, our institution, the Edith Wolfson Medical Center, a 700-bed government hospital serving the approximately 500,000 person population of Holon, Bat Yam, and Yaffo, Israel, launched the Program for the Treatment of the Hospitalized Diabetic Patient (PTHDP).⁵ Established as a hospital-wide care protocol based on the American Diabetes Association Standards of Medical Care in Diabetes 2007,⁶ the PTHDP employs a basal-bolus insulin regimen to achieve glucose homeostasis. Hemoglobin A1c (HbA1c) is assessed during the hospitalization to provide a baseline for follow-up as a measure of treatment efficacy. The multidisciplinary PTHDP team provides specialty consults and patient education and makes continuing treatment recommendations at patient discharge. Arrangements for post-discharge outpatient treatment are made to ensure true continuity of care.

Central to the PTHDP is the use of the institutional blood glucose monitoring system (IGMS).⁵ The IGMS includes two major components: an automated glucometer (ACCU-CHEK® Inform, Roche Diagnostics, Indianapolis, IN) and an integrated information system (Cobas IT 1000, Roche Diagnostics). An automated glucometer is located in each inpatient department. In contrast to the personal glucometers used previously, the automated glucometers used in the PTHDP are designed for institutional use, mandate calibration, and can be used only by authorized personnel. Data may be entered using a touch screen and/or bar code scanner and are electronically transferred, automatically generating a database and eliminating the paper record and its accompanying risk of error. Test results are stored with test and patient identifiers. Data are transmitted and downloaded automatically to the central database of the hospital's biochemistry laboratory. The integrated information system permits authorized personnel to access, monitor, and analyze data, which can be downloaded in spreadsheet format for the assessment of temporal trends and the identification

of out-of-range values. These data interface with the patient's electronic medical record.

On a clinical level, this system permits accurate patient follow-up within and between hospitalizations and permits clinicians to identify temporal glucose trends in a specific patient as well as response to interventions. On an administrative level, this system permits assessment of secular trends in glucose levels, as well as inter-departmental comparisons, which may serve as a measure of efficacy of care plan implementation. As more hospitals adopt this system, interhospital comparisons will also become possible.

A reduction of random glucose levels over time suggests that the PTHDP has been effective in improving diabetes care. Use of the automated glucometer in conjunction with the data management system has permitted identification of that improvement. Identification of trends would not have been possible without the automated glucometer and its accompanying information management system.

In Israel, the National Diabetes Council has recommended the use of automated institutional glucometers in all hospitals, citing their contribution to enhanced glucose homeostasis during hospitalization and improved patient care.

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